AMD FirePro™ R5000 Graphics Accelerator

User Guide

Part Number: 52948_enu_1.0

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Important Safety Instructions

Note: This product is for use only with compatible UL-listed personal computers that have installation instructions detailing user installation of this class of product.

Read all instructions before beginning installation. All safety and installation instructions should be read before the product is installed or operated.
Retain all instructions. Safety, installation, and operating instructions should be retained for future reference.
Heed all warnings. All warnings regarding the product and its operating instructions should be obeyed.
Use appropriate grounding.

Caution:

For continued protection against the risk of electric shock and fire, install this accessory only in products equipped with a three-wire grounding plug, a plug having a third (grounding) pin. This is a safety feature. Do not remove the grounding pin of a three-pin plug.

Attach product securely. All product-securing screws or fasteners should be completely tightened in order to provide continuous bonding between the product and the PC chassis, as appropriate.

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Chapter 1

Getting Started

Before you begin installing your new AMD FirePro™ R5000 graphics card (P/N: 102-C41902 -xx), please make sure you have the proper system requirements and have completed the required preinstallation tasks as outlined in this chapter.

1.1 Introduction

The AMD FirePro™ R5000 workstation graphics card is an integrated graphics accelerator plus display compression and IP transmission card. Its main function is to compress quad display graphics data and then output it out over a regular IP network to a remote thin client receiver system.

Note: When discussing AMD FirePro™ R5000 workstation graphics, “local” refers to the host PC/workstation/blade PC in which the graphics accelerator is installed, and “remote” refers to the thin client at the user's end.

AMD FirePro™ R5000 workstation graphics uses PC-over-IP® (PCoIP®) protocol developed by Teradici® for compression and transmission and must be hooked up to a PCoIP thin client system that receives and decompresses the data. This thin client receiver system is sold separately. AMD FirePro™ R5000 workstation graphics also compresses and transmits the keyboard and mouse data back and forth between the thin client and the host system.

The AMD FirePro™ R5000 workstation graphics cards can support four remote displays, when connected to a quad thin client receiver box.

1.2 System Requirements

Table 1–1 AMD FirePro Workstation Graphics System Requirements

Hardware	• AMD Opteron™, AMD Phenom™, AMD Athlon™, Intel Xeon, or Intel Core™ CPU. • 2 GB of system memory. • Motherboard with available ×16 PCI Express® bus connection slot. • USB-based keyboard and mouse for the thin client. • Power supply capable of delivering 150W with one AUX PCIe 6-pin (2x3) power connector. • Internet connection for installation software.
Operating System	Any of the following (32- or 64-bit unless specified): • Windows® 8. • Windows® 7. • Windows Vista®. • Linux®.
Monitor	• For local hosted output, DisplayPort-compatible displays are supported. • For remote thin clients, display output is determined by the output capabilities of the Teradici PCoIP receiver box. • For remote thin client quad-display support, a quad-display PCoIP receiver box with a Tera2 chip is required.

1.3 Recording Serial Numbers

The serial number and 102 part number on the graphics card are required for product registration and warranty (proof of purchase may be required). They are located on a sticker on the back of the graphics card and are shown in boldface and underlined in the illustration below.

Record these numbers in the space provided below and retain for future use.

1. Remove the graphics card from packing.
2. Locate the white label on the back of the graphics card.
3. Record the serial number and 102 part number.

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Figure 1–1 Typical Serial Number and 102 Part Number Arrangement

1	Serial number (S/N)
2	102 part number (P/N)

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Chapter 2

Hardware and Software Installation

This chapter details how to install your graphics accelerator in your system as well as where to download associated software and drivers.

2.1 Installation Overview

Once you have determined that your system meets the minimum requirements, perform the following tasks to install your new graphics accelerator. Detailed installation instructions are provided in the following sections.

1. If you are replacing an existing graphics accelerator, uninstall the old graphics driver and software.

   Note: If you are using a motherboard containing an on-board graphics solution and do not intend to use it as part of a multiple monitor display, disable it.
2. Turn off and disconnect your computer system.
3. If needed, remove any old graphics accelerator(s).
4. Install the new graphic accelerator.
5. Reassemble and connect your computer system and display(s).
6. Start the computer system and install the AMD FirePro™ drivers and configuration software.
7. Restart the computer system.

2.2 Installing a PCI Express Graphics Card

Please read all installation instructions completely before you begin.

If your computer has on-board graphics, you may need to disable it through the BIOS configuration. For more information, see your motherboard documentation.

Note: Always handle a graphics card with care when adding or removing it from your system.

- Never twist or bend your card.
- Avoid interference from the card's fan housing with mechanical hinges or clips inside your system's chassis.
- Make sure that the PCIe® card slot-locking mechanism on the motherboard is unlocked or open before inserting or removing a card. Please consult your motherboard manual for instructions, if necessary.

1. Turn off your computer, monitor(s), and other peripheral devices.

2. Unplug the computer's power cord, and then disconnect all cables from the back of the computer.

   Caution:
   Wait approximately 20 seconds after unplugging the power cord before disconnecting a peripheral cable or removing a component from the motherboard to avoid possible damage to the motherboard.

3. Remove the cover to your computer's case.

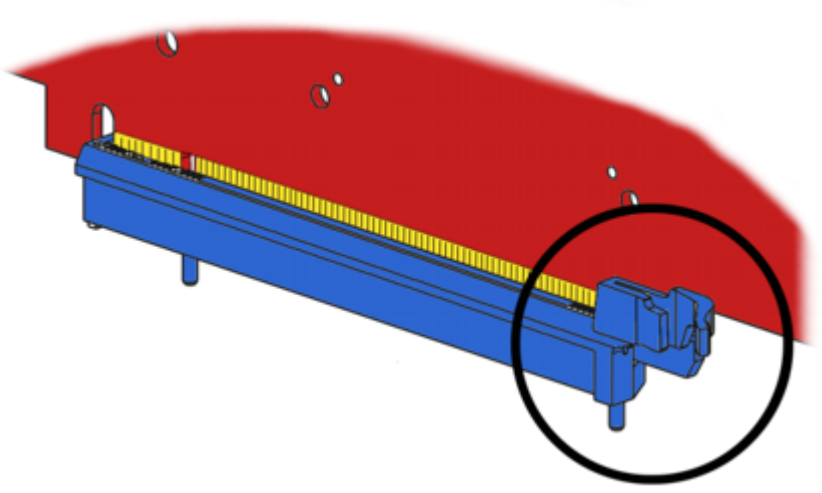
   Note: If necessary, consult your computer's manual for help in removing the cover.

   Caution:
   Static electricity can seriously damage computer components. Discharge your body's static electricity by touching the power supply or the metal surface of the computer chassis before you touch any components inside your computer's case to avoid damaging them.

4. Unscrew or unfasten and remove any existing graphics card from your computer, if necessary.

   Caution:
   Make sure the PCIe card slot-locking mechanism is unlocked or open before trying to remove a graphics card. Failure to do so may damage the card and/or the motherboard. This locking mechanism may be hidden from view by a card's fansink.

Figure 2–1 Example PCIe Card Slot-locking Mechanism



5. Locate the appropriate slot and, if necessary, remove the metal back-plate cover. Make sure all internal cables are clear of the slot.

6. Align your AMD FirePro graphics card with the PCIe slot and press it in firmly until the card is fully seated. You may need to hold open the PCIe card slot-locking mechanism with your finger when you seat the card.

7. Screw in or fasten the graphics card securely.

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8. If your card requires supplementary power and must be connected directly to the power supply, locate the appropriate power connector cable (or cables) from the power supply and connect it (or them) to the graphics card's supplementary power connector(s), which are usually located in the upper corner of the card.

   Note: Before installing a card that requires a supplementary power connection, make sure your existing power supply has such a connection available.

9. Make sure no internal cables are interfering with components inside the computer (for example, a cooling fan) and replace the computer cover.
10. Reconnect any cables that were disconnected during installation and plug in the computer's power cord.
11. Turn on the monitor, and then your computer.

If you have properly installed your graphics card, operating system messages will appear and the boot procedure will proceed.

Your monitor will be running in a basic (VGA) video mode. Higher refresh rates are not available at this stage of the installation. Once you have installed the AMD FirePro drivers and software, you can use the Windows® **Display Properties** dialog to adjust your video settings and configure multiple monitors.

Proceed to install the software and drivers for your AMD FirePro graphics card.

2.3 Installing Graphics Drivers and Software

To install or remove the drivers and software, you must be logged on as a user with administrator rights.

Drivers and configuration software, which include the Control Center software application, are provided to both operate and take advantage of all the features of the graphics accelerator. For information on some the key features that are available for your product, see Chapter 4 Using the Control Center Software (p. 13).

2.3.1 AMD Drivers and Software

Drivers are small but important programs that enable an operating system to communicate with a piece of hardware, such as a graphics card.

When you install a new graphics card, you must also install the driver and configuration software the card requires to function properly.

You also need to install (or reinstall) your AMD FirePro drivers when you have reinstalled or upgraded your operating system or when you download updated drivers.

The latest drivers are available from AMD's Web site at: support.amd.com/us/gpudownload/Pages/index.aspx.

Note: When reinstalling drivers, always uninstall any previous drivers that are on your system, even if they are for the same graphics card. Always start "fresh."

2.3.2 AMD Automatic Application Detection and Configuration

AMD FirePro drivers offer automatic application detection and configuration, which enables the graphics driver to automatically detect an application when it starts and configure the graphics driver settings for optimal performance.

This detection feature works with multiple open applications. As you switch between multiple applications, the graphics settings are always automatically configured for maximum performance for the particular application currently running.

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Chapter 3

Display Configuration

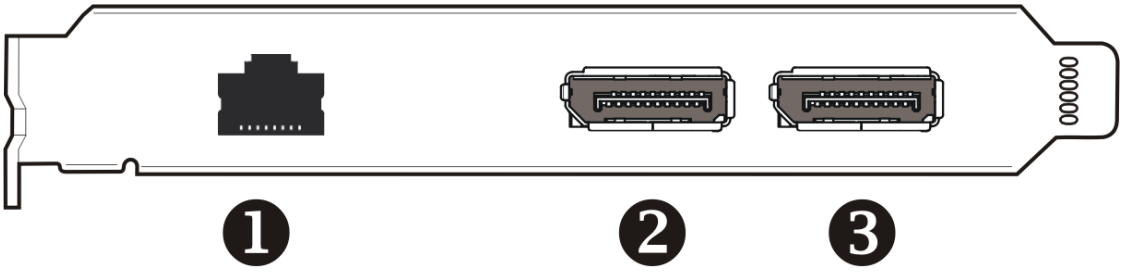
This chapter describes how to configure displays. It also lists available display connections for your graphics accelerator.

3.1 Baseplate Connections

The following figure shows the display connections available on your AMD FirePro™ R5000 workstation graphics card.

Note: Baseplate may not appear exactly as depicted.

Figure 3–1 AMD FirePro™ R5000 Workstation Graphics Baseplate Connections



1	RJ-45 connection for output to the network.
2, 3	Mini-DisplayPort connections supporting DisplayPort 1.2, for local output.

3.2 Display Configurations

Your AMD FirePro™ R5000 workstation graphics card provides local dual-display functionality through two mini-DisplayPort connections, and quad-display remote thin client functionality when paired with a quad-display PCoIP receiver box with a Tera2 chip. Displays and configurations available for the remote thin client are dependent on the capabilities of the PCoIP receiver box.

The maximum supported local resolution through the dual mini-DisplayPort connections is 2560 x 1600. The maximum supported remote resolution through the quad-display PCoIP receiver box connections is 1920 x 1200.

3.3 Setting up Remote Graphics

Remote graphics with the AMD FirePro™ R5000 workstation graphics card requires a PCoIP certified thin client receiver box.

Note: You must already have installed your AMD FirePro™ R5000 workstation graphics card in the host machine, with an appropriate driver installed. For more information, see Installing a PCI Express Graphics Card (p. 5).

1. Connect your AMD FirePro™ R5000 workstation graphics card to the network switch through the lower RJ-45 connection using a standard Ethernet cable.
2. Connect the displays, mouse, and keyboard to the PCoIP receiver box (“portal”) and connect the portal to the network.

   Note: Keyboard and mouse must be USB versions; non-USB mice and keyboards are not supported.
3. Determine the MAC addresses for the host system and PCoIP receiver box, and use your connection broker software to relate the portal to the host PC.

   Note: Connection broker software is not provided by AMD.

3.4 Configuring Local Displays as Remote Clones

Once your AMD FirePro™ R5000 workstation graphics card is set up for remote graphics, you can choose to configure the two local displays in clone mode with two remote displays.

Note: These instructions apply to a Windows® operating system. For advanced cloning features, LiveClone (a third party tool) is available at fireuser.com/tools/liveclone.

Note: You must already have installed your PoIP thin graphics receiver box. For more information, see Setting up Remote Graphics (p. 10).

1. Connect two remote displays to the thin client receiver box.
2. Connect two local displays to your AMD FirePro™ R5000 workstation graphics card using the two Mini-DisplayPort connections.
3. On the Windows desktop, right-click and select **Screen Resolution**.
4. Click **Identify**.
5. Determine which displays are remote and which are local using the numbers shown on each display.
6. In the **Multiple Displays** drop-down, select the **Duplicate** options corresponding to your remote and local displays, and click **Apply**.

   For example, if your remote displays are numbered 1 and 3 and your local displays are numbered 2 and 4, select **Duplicate 1 on 2**, and **Duplicate 3 on 4**.

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The two local displays are now clones of the two remote displays.

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Chapter 4

Using the Control Center Software

4.1 Control Center Overview

The Control Center software application contains settings for configuring and fine-tuning your AMD product. Use it to manage desktops and displays, optimize your graphics processor for enhanced 3D application and video quality, and configure your CPU for improved power savings or system performance. You can also use the performance tools in the application to monitor and manage clock speed and memory use for your graphics card to ensure that your AMD product is configured and running as efficiently as possible.

The application provides a Standard View for guided configuration and an Advanced View for quick and easy access to all available features and settings. It also provides a search feature for finding specific pages, as well as the ability to bookmark pages by pinning them within the application.

The following is a list of common configuration tasks that can be completed using the application:

- Adding and removing displays
- Rotating displays
- Setting the main (primary) display
- Duplicating and extending desktops
- Arranging desktops
- Enabling and disabling 3D application and video settings

More information on the application and its available features are provided through the comprehensive Control Center help system.

Note: Feature availability varies between AMD products and operating systems.

4.2 Starting the Control Center Software

To start the Control Center software application in Windows®, use any of the following methods:

Table 4–1 Control Center Access Routes in Windows®

Access Route	Instructions
Windows Desktop	1. Right-click anywhere on the desktop. 2. From the shortcut menu that appears, click the Control Center option.
Windows Start Menu	1. Click **Start** on the Windows task bar. 2. Click **All Programs** followed by the Control Center option.
Windows Notification Area	1. Right-click the Control Center icon in the Windows Notification Area. 2. From the shortcut menu, click the Control Center option.
Desktop Shortcut	If you chose to create a desktop shortcut to the Control Center application during the driver installation, double-click the shortcut.

To start the application in Linux®, type the command `amdcccle` in the terminal window.

To start the application with superuser privileges, do any of the following:

- Log on as a superuser before running the command `amdcccle`.
- Run the command `sudo amdcccle` and provide the superuser password when prompted.
- Run the command `amdxdg-su -c amdcccle` and provide the superuser password when prompted.

Note: Certain Control Center settings can only be changed with superuser privileges.

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Chapter 5

Remote Graphics

This section provides a brief overview of remote graphics—specifically PC-over-IP® (PCoIP®), a technology developed by Teradici® for remotely connecting a thin client to a PC/workstation/blade PC containing an AMD FirePro™ R5000 workstation graphics card.

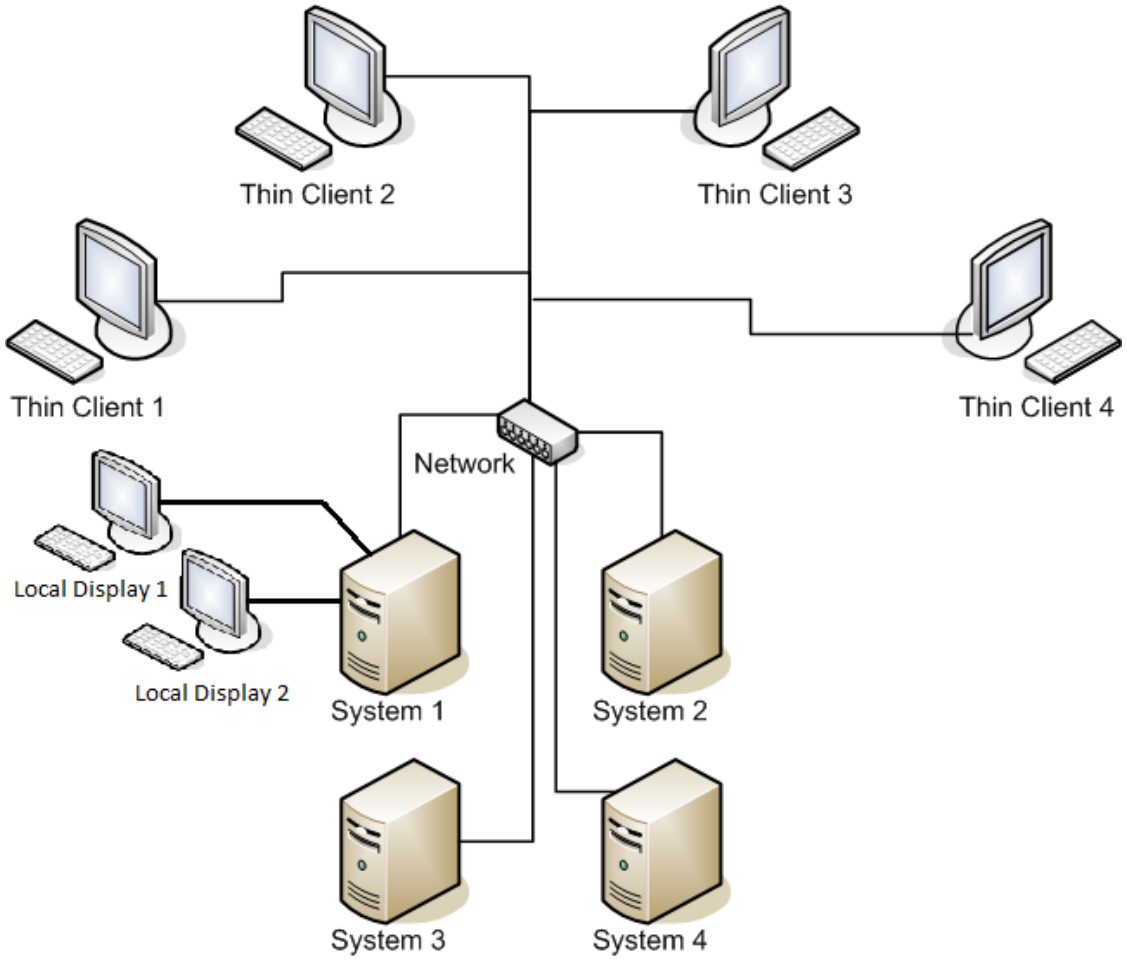
5.1 Remote Graphics Hardware

Remote graphics help separate a workstation user from the physical PC while providing the same graphics performance and computing experience offered by a discrete workstation graphics accelerator. Typically, this results in a work environment where users have a thin client, displays, keyboard, and mouse on their desks, while the PC systems or servers containing the CPU, graphics solution, and hard drives are all located together somewhere else.

AMD FirePro™ R5000 workstation graphics combines a workstation GPU and a PCoIP transmitter on a single PCIe® add-in card.

The PC connects to a thin client using a RJ-45 connection. This connection supports quad remote displays at up to 1920×1200 resolution.

Figure 5–1 Typical Remote Graphics Setup



Note: AMD FirePro™ R5000 workstation graphics is not in itself a virtualized system; the users are connected to dedicated desktop PC or blade PC systems on a 1:1 basis and retain full discrete workstation graphics (and CPU) performance.

A remote graphics solution can offer a number of advantages:

- Increased data and system security.
- Less cluttered, less noisy workspaces.
- Streamlined IT maintenance and troubleshooting, including OS migration, patching, and software installation.

Note: AMD FirePro™ R5000 workstation graphics works with any PCoIP-certified thin client solution.

Figure 5–2 PCoIP Certification Logo

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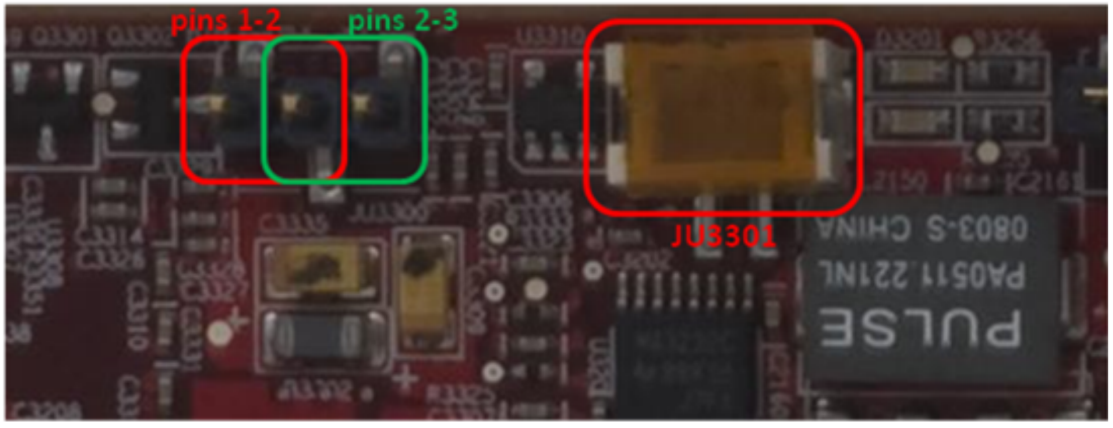
5.2 Wake-on-LAN (WOL) Configuration

There are two ways to configure WOL:

1. If your motherboard supports PCI_WAKE# signal (check with your motherboard supplier to see if this is supported):
   - If required, configure the system BIOS to enable “power on by PCIe devices.”
   - Short pins 2-3 on JU3300.
2. If your motherboard does **not** support PCI_WAKE# signal:
   - To mimic the chassis power button being pushed: short pins 1-2 on JU3300.
   - To send the WOL signal: connect JU3301 to PWR_SW pins on the motherboard (power cable not included).

Figure 5–3 Wake-on-LAN

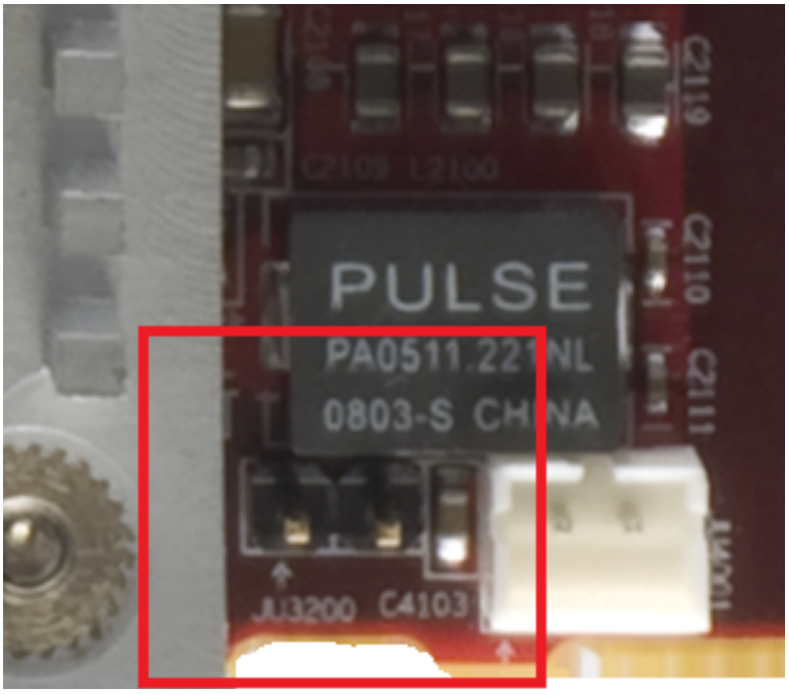


5.3 Full Reset

To do a full reset on the board:

1. Short JU3200.
2. Power on and boot the system.
3. Shut down the system and remove the jumper.

Figure 5–4 Full Reset Using JU3200



5.4 Network Considerations

PCoIP does not require special network equipment or graphics drivers. Some form of network connection brokering software is required, however.

The amount of network bandwidth required for remote graphics is entirely dependent on the type of user and the software applications required. PCoIP technology dynamically adjusts the data compression/quality based on available network resources. PCoIP solutions can also be customized to share network resources "unfairly," favoring certain users over others.

The following table shows a rough estimate of the bandwidth required for different user types with displays running at a variety of resolutions.

Table 5–1 Estimated Bandwidth Requirements Based on User Type and Display Resolution

User category	1024×768	1280×1024	1680×1050	1600×1200	1920×1200
Task Worker	3 Mbps	5 Mbps	7 Mbps	6 Mbps	-
Knowledge Worker/Basic CAD	10 Mbps	15 Mbps	20 Mbps	22 Mbps	25 Mbps
Performance User/3D Modeling	30 Mbps	45 Mbps	60 Mbps	65 Mbps	80 Mbps
Video Editing	-	60 Mbps	80 Mbps	85 Mbps	100 Mbps
Extreme Bandwidth Allocation	-	120 Mbps	160 Mbps	170 Mbps	200 Mbps

Network latency should be less than 30 ms to ensure seamless remote responsiveness. Both LAN and WAN setups are supported.

All PCoIP traffic is encrypted with 256-bit AES for the display and USB and SSL for management and configuration traffic.

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Chapter 6

Reference

This chapter provides notices, troubleshooting tips, and customer care, warranty, and standards-compliance information.

6.1 Product Features

This chapter describes some of the special features that are associated with the AMD FirePro™ R5000 product and are available through the Control Center software application.

Note: Feature availability varies between AMD FirePro™ products and operating systems.

6.1.1 Hydravision

The **Hydravision** tab on the **Workstation** aspect of the Control Center application provides a number of display options.

6.1.1.1 Hydragrid

You can use HydraGrid to apply invisible grid layouts to desktops in single- and multi-display environments. When HydraGrid is enabled, application windows can be attached to individual cells in a grid, restricting their display to a specific area on a desktop.

HydraGrid preserves layouts on a per-user basis and is designed for window management across large, multiple, or virtual desktops.

Note: HydraGrid does not affect full-screen and non-resizable applications.

6.1.1.2 Desktop Manager

Desktop Manager contains options for configuring the behavior of application windows and dialogs in a multi-display environment. With Desktop Manager you can:

- Preserve and restore application window position and size.
- Maximize application windows across multiple displays.
- Reposition application dialog boxes.

Tip: To access the full capabilities of Desktop Manager, ensure you are working in a multi-display environment, as not all features are available in a single-display environment.

6.1.1.3 Multi Desktop

Using the Multi Desktop component of HydraVision, you can create and manage up to nine virtual desktops, each with their own display settings and background image. One desktop can be made visible at a time, while others can run in the background.

Using Multi Desktop, you can also:

- Switch between desktops using a mouse click or hot key.
- Run applications on a particular desktop or all desktops.
- Move running applications between desktops.
- Save, restore, and delete desktop profiles.

6.1.2 DisplayPort Audio

DisplayPort audio requires up-to-date graphics drivers, and the display device must support DisplayPort audio.

As with HDMI™, DisplayPort audio is enabled through Windows®. For more information, consult your Windows documentation.

6.2 Workstation Card Troubleshooting

The following troubleshooting tips may help if you experience problems.

More troubleshooting information can be found using the knowledgebase on the AMD Web site at http://support.amd.com/.

6.2.1 Computer does not boot up properly.

Verify that the installation instructions were properly followed. In particular, if external power is required, make sure that the external power cable (or cables) is properly connected.

Check that the card is properly installed in your system and connected to your monitor.

If you have problems during start-up, restart your computer in Safe Mode.

Check the system configuration utility of your operating system for the interrupt assignments.

Contact AMD's Customer Care or your local technical support.

6.2.2 There is no display.

Make sure the card is seated properly in its slot. If external power is required, make sure that the external power cable (or cables) is properly connected to the card.

Make sure that the monitor cable is securely fastened to the card.

Make sure that the monitor and computer are plugged in and receiving power.

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If necessary, disable any built-in graphics capabilities on your motherboard. For more information, consult your computer's manual or manufacturer.

Note:

- Some manufacturers do not allow the built-in graphics to be disabled or to become the secondary display.
- If your system has built-in graphics capabilities, make sure that you uninstall the associated driver to prevent conflicts with AMD graphics drivers.

Make sure that you selected the appropriate monitor when you installed your enhanced driver.

Make sure that the display resolution and refresh rate settings you have selected are supported by the monitor you have connected.

6.2.3 There are screen defects.

Make sure your monitor supports the resolution and horizontal (kHz) and vertical (Hz) refresh rates as required by the graphics card. Check your current resolution, refresh rate, and color depth settings in the Settings and Monitor tabs in your Display Properties dialog.

Caution:

Ensure that both the graphics card and monitor support the resolution and refresh rates you select. Incompatible resolution/refresh rate selection may result in monitor damage. Refer to your monitor's documentation for recommended resolutions and refresh rates.

6.2.4 The screen image is off-center or there are odd colors.

Try adjusting the brightness, sharpness, contrast, and color balance controls of your monitor.

Try adjusting the centering and positioning controls of your monitor to position the picture on the screen.

Set the monitor's RGB inputs (and sync switches, if this option is available) to 75 Ohms, with the sync set to external.

DFP monitor users: Make sure that the DVI plug of your monitor data cable is digital-only (DVI-D), not integrated analog/digital (DVI-I). Refer to your monitor's documentation and contact your supplier or the manufacturer of the DFP monitor for information on how to obtain a suitable data cable plug.

If you need to use DisplayPort or Mini DisplayPort adapters other than the ones included with your graphics card, make sure that you use AMD Eyefinity validated dongles. For more information, see http://support.amd.com/us/eyefinity/Pages/eyefinity-dongles.aspx.

6.2.5 The operating system warns that the graphics card isn't properly configured.

Make sure that the display resolution and refresh rate settings you have selected are supported by the monitor you have connected.

Check the driver installation and make sure that all software is correctly loaded corresponding to your operating system and applications.

Reinstall the drivers for your graphics card.

6.2.6 There are bus address or interrupt conflicts.

Make sure that the I/O and memory addresses reserved for the graphics board are not used by other hardware devices. The integrated on-board VGA controller of your AMD FirePro card uses the following addresses (hex):

- **I/O Address:** Standard VGA I/O: 3B0-3DF
- **Memory Addresses:** Video RAM: A000-BFFF, Video ROM: C000-C7FF

You cannot change the addresses of your AMD FirePro card. In case of an address conflict, try to modify the I/O address of the add-on card that causes the conflict.

To support the special graphics processor on the AMD FirePro card, the system BIOS should automatically assign a system interrupt to the slot where the card is installed. However, there may be problems if your graphics card does not receive an interrupt or a system interrupt is used for more than one device. In case of problems, check the system configuration utility of your operating system for the interrupt assignments.

6.3 Workstation Customer Care

The AMD Customer Care Web site has number of helpful resources, including a knowledgebase of FAQs, warranty services, and the AMD FirePro Workstation Graphics Web Ticket Submission Page.

The Web site is complimentary and available at all times. The address is http://support.amd.com.

6.3.1 Contact Information

If you experience difficulties with your AMD FirePro product, you can contact AMD Customer Care in the following ways.

The latest contact information and tips for faster service can be found on the AMD Global Technical Support page at http://support.amd.com/us/contacts/Pages/global-technical-support.aspx.

6.3.2 Disclaimer

AMD Customer Care will work to resolve your issue and help you to get your product up and running. If your issue is not resolved, our technicians will determine whether

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the difficulty you are experiencing is the result of the product, whether your product contains a defect, and whether your product should be returned to AMD for warranty service.

AMD Customer Care is unable to assist with refunds, returns, or exchange-specific inquiries. If resolving the problem being experienced is critical to your decision to keep the product, it is your responsibility to ensure that you know and are within the period of time your reseller will allow for refunds, returns, or exchange.

AMD is not responsible for any expense incurred accessing Customer Care. It is expected that customers will review the expense associated with the available support options and will choose the method that best meets their needs and budget.

AMD Customer Care reserves the right to limit support options for products that are not registered or are at End of Life.

6.4 Workstation Warranty Service

For warranty service instructions visit http://support.amd.com/us/warranty/Pages/SupportWarrantyServices.aspx or contact one of our Customer Service Representatives.

6.4.1 Shipping

Before shipping any unit for repair, obtain an RMA number for warranty service.

When shipping your product, pack it securely, show the RMA and serial number of the product on the outside, and ship prepaid and insured.

AMD will not be held liable for damage or loss to the product in shipment.

Standard warranty service consists of repair upon receipt.

AMD reserves the right to replace the product with a serviced product at their sole discretion at any time.

You are responsible for the cost of shipping the product to AMD. AMD pays the cost of returning the product to you.

Products which are repaired under warranty are guaranteed for the remainder of the original warranty period. Repairing or exchanging a product does not start a new warranty period. If, at the time of repair, a product is already “out of warranty” or within the last 90 days of the warranty period, AMD will guarantee the repair for the full 90 days. All other terms and conditions of the original warranty apply.

6.4.2 Limitations

All warranties for this product, expressed or implied, will expire three (3) years from date of original purchase.

All accompanying cables and accessories are warranted for 90 days.

No warranties for this product, expressed or implied, shall extend to any person who purchases the product in a used condition.

The liability of AMD in respect of any defective product will be limited to the repair or replacement of such product. AMD may use new or equivalent-to-new replacement parts. Defective product will be sent in for repair or replacement only. AMD makes

no other representations or warranties as to fitness for a particular purpose, merchantability or otherwise in respect of the product. No other representations, warranties or conditions, shall be implied by statute or otherwise. In no event shall AMD be responsible or liable for any damages, including but not limited to the loss of revenue or profit, arising:

- From the use of the product, as a result of any event, circumstance, action or abuse beyond the control of AMD; whether such damages be direct, indirect, consequential, special or otherwise and whether such damages are incurred by the person to whom this warranty extends or a third party
- From the loss of use of the product, as a result of any event, circumstance, action or abuse beyond the control of AMD; whether such damages be direct, indirect, consequential, special or otherwise and whether such damages are incurred by the person to whom this warranty extends or a third party.

Unauthorized repairs to an AMD board level product will void the warranty offered by AMD. AMD reserves the right to refuse to service any product which has been altered, modified, or repaired by non-AMD service personnel.

6.5 International Compliance Information

This section details the worldwide compliance information for this product, which is manufactured to be compliant in the regions where it is sold.

AMD products are either Class A or Class B compliant and are indicated accordingly on the compliance label for each product. The following regulatory information applies to Class A and Class B products.

6.5.1 FCC Compliance Information (USA)

Class A

This device complies with Part 15 of the FCC Rules. Operation is subject to the following conditions: (1) this device may not cause harmful interference and (2) this device must accept any interference received, including interference that may cause undesired operation.

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are design to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with manufacturer's instructions, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case, the user will be required to correct the interference at his own expense.

Warning:

Changes or modifications to this device not expressly approved by Advanced Micro Devices, Inc. could void the user's authority to operate the equipment.

FCC Part 15, Subpart B, Class A

Class B

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This product complies with FCC Rules Part 15. Operation is subject to the following conditions:

- This device may not cause harmful interference.
- This device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with manufacturer's instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Re-orient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment to an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

The use of shielded cables for connection of the monitor to the graphics card is required to ensure compliance with FCC regulations. Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

Caution:

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

FCC 15, Subpart B, Class B

For further compliance information:

Advanced Micro Devices, Inc.
1 AMD Place
P.O. Box 3453
Sunnyvale, CA 94088-3453
USA Tel: 408-749-4000

6.5.2 Industry Canada Compliance Statement (Canada)

Class A

This Class A digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la Classe A est conforme à la norme NMB-003 du Canada.

Class B

This Class B digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la Classe B est conforme à la norme NMB-003 du Canada.

6.5.3 CE Compliance Information (European Union)

Class A

Warning:

This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

EMC Directive 2004/108/EC

CISPR 22/EN 55022–Class A: Limits and methods of measurement of radio disturbance characteristics of Information Technology Equipment.

CISPR 24/EN 55024–Information Technology Equipment–Immunity Characteristics—Limits and Methods of Measurements

Class B

EMC Directive 2004/108/EC

CISPR 22/EN 55022—Class B: Limits and methods of measurement of radio disturbance characteristics of Information Technology Equipment.

CISPR 24/EN 55024—Information Technology Equipment—Immunity Characteristics —Limits and Methods of Measurements

6.5.4 Electrical Safety

Europe: The Low Voltage Directive–2006/95/EC

- EN 60950-1–Safety of Information Technology Equipment

USA/Canada:

- UL 60950-1 (Information Technology Equipment–Safety—Part 1: General Requirements)
- CSA C22.2 No. 60950-1 (Information Technology Equipment—Safety–Part 1: General Requirements)

International:

- IEC 60950-1 (Information Technology Equipment–Safety-Part 1: General Requirements)

To meet UL safety requirements, the computer's maximum room temperature should not exceed 40 ℃.

This product complies with the PCI Express 300W Electromechanical Specification — please refer to the manufacturer for additional information. Other relevant input power data will also be available.

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6.5.5 VCCI ITE Compliance Information (Japan)

Class A

この装置は、クラスＡ情報技術装置です。この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。
ＶＣＣＩ－Ａ

Translation:

This is a Class A product based on the standard of the VCCI Council. If this equipment is used in a domestic environment, radio interference may occur, in which case, the user may be required to take corrective actions.

VCCI V-3

Class B

この装置は、クラスＢ情報技術装置です。この装置は、家庭環境で使用することを目的としていますが、この装置がラジオやテレビジョン受信機に近接して使用されると、受信障害を引き起こすことがあります。
取扱説明書に従って正しい取り扱いをして下さい。
ＶＣＣＩ－Ｂ

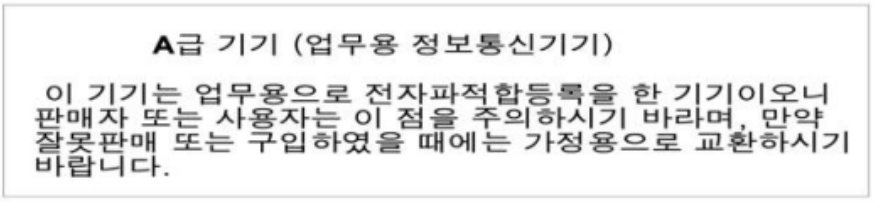
Translation:

This is a Class B product based on the standard of the VCCI Council. If this is used near a radio or television receiver in a domestic environment, it may cause radio interference. Install and use the equipment according to the instruction manual.

VCCI V-3

6.5.6 KC Certification Information (Korea)

Class A



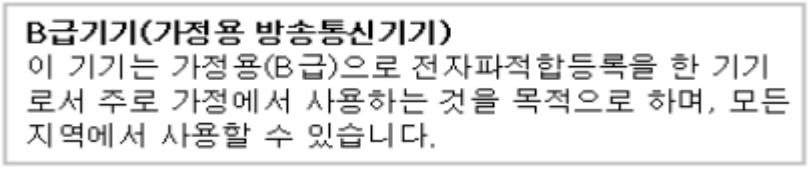
Translation:

"Class A" Equipment (Business purpose info/telecommunications equipment)

As this equipment has undergone EMC registration for business purpose, the seller and/or buyer is asked to beware of this point and in case a wrongful sale or purchase has been made, it is asked that a change to household use be made.

KN22 and KN24

Class B



Translation:

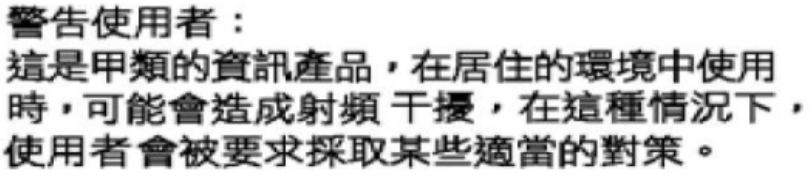
"Class B" Equipment (Household purpose info/telecommunications equipment)

As this equipment has undergone EMC registration for household purpose, this product can be used in any area including residential area.

KN22 and KN24

6.5.7 BSMI Certification Information (Taiwan)

Class A



Translation:

This is a Class A Information Product, when used in residential environment, it may cause radio frequency interference, under such circumstances, the user may be requested to take appropriate countermeasures.

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CNS13438

Class B

CNS13438

6.5.8 C-Tick (Australia and New Zealand)

ACMA — Australian Communications and Media Authority

- Radiocommunications Act 1992 (Australia)—per notices of section 182
- AS/ NZS CISPR 22

6.5.9 Product Environmental Compliance

This product may carry a marking similar to those below that indicates its level of compliance with China RoHS standards.

For information on China RoHS, EU RoHS, or EU REACH compliance, please refer to Product Environmental Compliance on the AMD Web site.

6.5.10 Waste Electrical and Electronic Equipment (WEEE) Directive Compliance (European Union)

This product was manufactured by Advanced Micro Devices, Inc.

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